

REMARKS/ARGUMENTS

Favorable reconsideration of this application, in light of the present amendments and following discussion, is respectfully requested.

Claims 1-20 are pending. Claims 13-18 are withdrawn. Claim 1 is amended. Claims 19 and 20 are newly added. Support for the amendment to Claim 1 and for newly added Claims 19 and 20 can be found in Fig. 2A, for example. Support for newly added Claim 21 can be found in Figs. 5A-5C, for example. No new matter is added.

In the outstanding Office Action, the restriction requirement dated August 24, 2005, was made final. Claims 1-4, 6, 11, and 12 were rejected under 35 U.S.C. § 103(a) as obvious over Barnes et al. (U.S. Patent Pub. 2002/0150519, hereafter “Barnes”) in view of Halder et al. (U.S. Patent No. 5,845,898, hereafter “Halder”). Claims 5 and 7-9 were rejected under 35 U.S.C. § 103(a) as obvious over Barnes and Halder in view of Werner et al. (U.S. Patent No. 5,845,898, hereafter “Werner”) and Dornfest et al. (U.S. Patent No. 5,680,013, hereafter “Dornfest”). Claim 10 was rejected under 35 U.S.C. § 103(a) as obvious over Barnes, Halder, and Werner in view of Moser (U.S. Patent No. 6,686,302, hereafter “Moser”).

At the outset, Applicant wishes to thank Examiner Zervigon for the courtesy of a personal interview granted to Applicant’s representatives during which the current rejections and present amendments were discussed. The substance of the interview is substantially summarized below.

Regarding the rejection of Claims 1-4, 6, 11 and 12 as obvious over Barnes in view of Halder, that rejection is respectfully traversed by the present response.

As discussed in the personal interview, the present invention relates to securing an upper electrode to an inject plate in a plasma processing device. Plasma processing devices require cleanliness in order to perform highly sensitive deposition and etching processes typically associated with semiconductor processing. Conventional bolts used to secure the

inject plate to the upper electrode require manually unscrewing of each bolt inserted in the inject plate. Once each bolt is unscrewed it has to be removed from the process chamber and rested on a surface outside the process chamber. Accordingly many loose parts are associated with such maintenance of the semiconductor processing chamber. Additionally, when each bolt is removed from the inject plate, a risk exists of dropping the bolt somewhere within the plasma processing device. Such accidental dropping of the bolt can harm internal components and is likely to contaminate the surface of the process chamber by chipping or otherwise generating particles.

The present inventor recognized that in the defect-critical area of semiconductor processing and plasma processing chambers, a need exists to minimize the number of loose parts associated with maintenance of the plasma processing device, especially regarding removal and replacement of the inject plate. The present inventor recognized that if the threading-in and threading-out process associated with conventional bolts could be replaced by a hybrid ball-lock device, cleanliness within the chamber would be improved and the hybrid ball-lock device would be less likely to fall onto a surface within the chamber when the inject plate was removed. Accordingly, as the hybrid ball-lock device can maintain its location within the inject plate even when the inject plate is detached from the upper electrode, a maintenance person performing maintenance on the inject plate or the upper electrode will be less likely to drop loose pieces of hardware and will have fewer pieces of hardware to keep track of. Removal of threaded hardware such as bolts is time consuming and requires hand or power tools which tend to create particles in the plasma processing chamber as the hardware is removed and replaced. Further, each item of hardware adds to the time required and detracts from cleanliness of the maintenance procedure. Accordingly, Applicant developed the present invention as recited for example in amended Claim 1.

Amended Claim 1 recites:

A plasma processing device comprising:  
an inject plate including a first hole with a first diameter;  
an upper electrode including a second hole with a recessed area  
having a second diameter larger than the first diameter; and  
a hybrid ball-lock device configured to removably secure the inject  
plate to the upper electrode by expanding into the recessed area.

Accordingly, the upper electrode includes a hole with a recessed area with a bigger diameter than the diameter of the hole in the inject plate. The hybrid ball-lock device then secures the inject plate to the upper electrode by expanding into the recessed area.

As acknowledged in the outstanding Office Action and discussed in the personal interview, Barnes does not disclose a hybrid ball-lock device.<sup>1</sup>

The outstanding Office Action relies on Halder for the feature of a ball-lock device. However, as discussed in the personal interview, the device described in Balder does not use a second hole with a recessed area having a second diameter larger than a diameter of a first hole. Rather, as shown in Figs. 1-2, the plates (6) and (6') each include a hole of equal diameter. The tubular bolt (3) passes through the aligned holes (5) and passes completely through the plates (6) and (6'). Thus, the balls (7) expand in an area completely external to either plate (6) or (6'). Accordingly, it is not a recessed area which accepts the balls (7), but a completely open area separate from either of plates (6) and (6').

As Barnes fails to disclose a hybrid ball-lock device, much less a recessed area to accommodate a hybrid ball-lock device, and the connector described in Halder fails to disclose a recessed area for the hybrid ball-lock device to expand into to secure an inject plate to an upper electrode, Applicant respectfully submits that no reasonable combination of Barnes with Halder includes all of the features recited in amended Claim 1. Accordingly, Applicant respectfully submits that the rejection of independent Claim 1 is overcome.

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<sup>1</sup> Outstanding Office Action at 2-3.

Claims 2-4, 6, 11, and 12 depend, directly or indirectly, from amended Claim 1 and patentably distinguish over the cited references for at least the same reasons as discussed above regarding the rejection of amended Claim 1 .

Regarding the rejection of Claims 5 and 7-9 as obvious over Barnes, Halder, and Dornfest, that rejection is respectfully traversed by the present response.

The outstanding Office Action relies on Dornfest for the features of various materials recited in dependent Claims 5 and 7-9. However, nothing in Dornfest remedies the deficiencies discussed above regarding Barnes and Halder and the rejection of independent Claim 1. Dornfest relates to ceramic protection for heated metal surfaces of plasma processing chambers. Dornfest does not disclose a hybrid ball-lock device, much less that the hybrid ball-lock device removably secures an inject plate to an upper electrode by expanding into a recessed area with a diameter larger than the diameter of a hole in an inject plate. Accordingly, Applicant respectfully submits that dependent Claims 5 and 7-9 patentably distinguish over the cited references for at least the reasons discussed above.

Claim 10 was rejected as obvious over Barnes, Halder, and Moser. The outstanding Office Action relies on Moser for the feature of corrosion resistant steel (CRES). Moser does not disclose a hybrid ball-lock device configured to removably secure an inject plate to an upper electrode by expanding into a recessed area with a larger diameter than a hole in the inject plate. Rather, Moser is unconcerned with fasteners used to connect one plate to another. Accordingly, Applicant respectfully submits that the rejection of Claim 10 is overcome.

Applicant wishes to make the following additional arguments regarding newly added Claims 19-21.

Claim 19 recites that the inject plate is configured to accept insertion of the ball-lock device from inside the process chamber. Accordingly, the connection between the inject

plate and the upper electrode is made via a ball-lock device inserted from inside the process chamber. In contrast, none of the cited references show an inject plate attached to an upper electrode via a ball-lock device inserted from inside the process chamber. Accordingly, Applicant respectfully submits that newly added dependent Claim 19 patentably distinguishes over the cited references for at least this additional reason.

Regarding newly added dependent Claim 20, this claim recites that the second hole is a blind hole. Applicant respectfully submits that none of the cited references describe a second hole in an upper electrode with a recessed area having a diameter larger than the diameter of a first hole located in an injection plate wherein the hole in the upper electrode is a blind hole. Rather, Barnes describes a through hole in the lid (7). The outstanding Office Action points to the lid (7) for the feature of an upper electrode.<sup>2</sup> Accordingly, Barnes fails to disclose a second hole in an upper electrode wherein the second hole is a blind hole.

Halder, as shown in Figs. 1 and 2, describes aligned holes (5) which are both through holes completely penetrating the plates (6) and (6'). Accordingly, Halder fails to disclose a blind hole, much less a blind hole in an upper electrode with a recessed area having a diameter larger than a hole in an inject plate diameter.

As discussed above in the discussion of the rejection of Claim 1, none of the other references disclose securing an inject plate to an upper plate with a hybrid ball-lock device, much less what type of hole is included in the upper electrode. Accordingly, neither Dornfest nor Mosier remedies the deficiencies discussed above regarding Halder and Barnes. Accordingly, Applicant respectfully submits that newly added Claim 20 patentably distinguishes over the cited references for at least these additional reasons.

Regarding newly added Claim 21, this claim recites the feature of a spring with an axis oriented perpendicular to an axis of the second hole and configured to push a ball into

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<sup>2</sup> Outstanding Office Action at 2, item 3.

the recessed area. Accordingly, a spring must be disposed in the direction perpendicular to the axis of the second hole.

The outstanding Office Action relies on Halder for the feature of a ball-lock device. However, as shown in Figs. 1 and 2 of Halder, no spring is disposed with an axis perpendicular to an axis of either of the aligned holes (5). Accordingly, Applicant respectfully submits that newly added Claim 21 patentably distinguishes over Halder and the other cited references for at least this additional reason.

Consequently, in view of the above discussion, it is respectfully submitted that the present application is in condition for formal allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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